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What is a good reputation? Career concerns with heterogeneous audiences

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ABSTRACT

When an agent faces audiences with heterogeneous preferences, it is non-trivial to determine what a "good" reputation means, and the return to reputation can be a non-monotonic function. We illustrate this through standard IO examples, and discuss some implications for reputation-building in a simple two-period career concerns framework. We conclude by discussing other observations concerning the impact of heterogeneous audiences on reputation-building.

1. Introduction

This paper forms part of a wider, on-going research agenda that aims to explore reputation and career concern incentives when an agent faces heterogeneous audiences. In almost any practical application that one could conceive of, audiences for an agent's reputation have different preferences, different information, or both different information and preferences. In some applications, these differences may be sufficiently small that there is little loss in ignoring them. However, in a large range of applications, differences in preferences and information among audiences are substantive: Examples range from a politician facing different constituents to a credit-rating agency building reputation with both issuers and investors, or to a CEO dealing with shareholders, employees, suppliers and competitors.

In economic models, an agent's "reputation" is a probability distribution, interpreted as the common belief regarding the likelihood that agent is of one type rather than another.[1] The literature explores how a strategic agent might take actions to affect the evolution of this belief through time—indeed, this is the central focus of the literature. Knowledge of the agent's type is useful for an audience in predicting the agent's future behavior; in particular, if the agent is a "commitment" type then the agent's behavior is deterministic and completely determined by his type. The agent's type is typically considered to be unidimensional.[2] Moreover, there is a monotonic ordering over types in terms of the audience's preferences. Put differently, in existing work, it is clear what a "good" reputation is, and the main concern has been to understand the optimal behavior that might lead to (or exploit) a good reputation. This is our point of departure in this paper.

One of our main contributions is to highlight that, with heterogeneous preferences, identifying a "good" reputation itself is non-trivial. We first focus on the question of what is a good reputation, by introducing a "return-to-reputation" function. We show that, with heterogeneous preferences, even with a natural order over types, the reputational rewards for an agent may be non-monotonic in type. We then focus on the question of how the agent's optimal action choices are affected by reputation concerns. We take the simplest possible approach to do this, by analyzing reputation incentives in a two-period career concerns model. We show that non-monotonic gains to reputation also imply that the agent's optimal action may be non-monotonic in reputation, and can display sharp reversals in direction.

The findings in this paper are consistent with several applications. Non-monotonic rewards to reputation arise in applications in finance, marketing, and IO. See, for instance, Bouvard and Levy (2012) who model credit rating agencies facing both issuers and consumers, and show that the return to reputation can be non-monotonic. Similar

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[1] See Bar-Isaac and Tadelis (2008), Cabral (2005), Cripps (2006), and Mailath and Samuelson (2006) for introductions to and overviews of the literature. Another stream of literature, sometimes called "trust" rather than "reputation" builds on repeated games.

[2] For exceptions see Austen-Smith and Fryer (2005) and Kartik and McAfee (2007).

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effects arise in IO models with vertical or horizontal differentiation. Reversals in behavior in reputational contexts are also observed in practice. There are several examples in marketing, where a firm that faces a horizontally differentiated market is seen to dramatically change its advertising message from time to time. An interesting example is Marlboro, which started out targeting women, and later reversed its image completely to target a male audience with the "Marlboro man." We discuss this in more detail in Section 3.

The exposition is structured as follows. In Section 2, we present the basic framework, and establish non-monotonicity of the returns to reputation in standard IO settings. In Section 3, we characterize how the agent's optimal action is affected by reputation concerns. Here, we revisit the IO examples from Section 2 and show how there can be reversals in the optimal action choice. Section 4 concludes.

2. Heterogeneous audiences and reward functions: examples

2.1. General framework

We consider an agent of type θ, where θ has c.d.f. F. The agent holds this prior F commonly with the audience. The agent can take an action $a \in \mathbb{R}$, at a cost $c(a)$ where $c'(|a|) > 0$ and $c''(|a|) > 0$.[3] In particular, for the examples in this paper, we assume that $c(a) = \frac{1}{2}a^2$. The agent's action together which his type generate a (noisy) public signal or outcome $s = \theta + a + \varepsilon$ where ε is normally distributed with mean 0 and, without loss of generality, variance 1. In this paper, we consider a two-period model, and in particular, we consider the value of holding a given reputation in a terminal period when the agent takes only a costless action. In this case, the outcome that the agent is expected to produce depends only on her anticipated type. Specifically, the expected outcome generated is exactly the type of the agent, θ. An audience observes signal, s, and uses it (together with its expectations about the agent's action) to form a posterior belief about the agent's type. Note that observing the signal s is equivalent to observing a signal $z = s - a^*$, where a^* is the expected equilibrium action. The agent then earns a payment that depends on the audience's posterior belief about his type: We introduce the notation $R(G(\cdot))$ to denote the agent's reward, where $G(\cdot)$ denotes the public reputation or the posterior belief that the audience has about the agent's type. Indeed, the agent earns payment $R(\mathbb{E}[\theta|z]|)$,[4] and therefore, the agent's general problem is to choose an action to maximize his expected return, i.e., choose a to maximize $\mathbb{E}_{\varepsilon,0}[R(\mathbb{E}[\theta|z])] - c(a)$.

We call the function $R(\cdot)$ the agent's return-to-reputation or reward function. This is the value that an agent earns from starting a period with a given reputation.

2.2. Benchmark example: homogeneous audience

We begin by considering the canonical case introduced in Holmström (1999). Here, the agent is a manager with type θ drawn from distribution $F(\theta)$, which is the normal distribution with mean μ and variance σ^2. The manager faces a competitive labor market, and gets paid at the end of the period, based on the market's belief about his type: In particular, the maximal willingness to pay for an expected outcome of $\mathbb{E}(\theta + \varepsilon) = \mathbb{E}(\theta)$ is exactly $\mathbb{E}(\theta)$, and a competitive market implies that the agent receives $\mathbb{E}(\theta)$; that is, $R(\mathbb{E}(\theta)) = \mathbb{E}(\theta)$. Notice that the reward to reputation is linear in the reputation level.

Below, we depart from this benchmark case, and allow audiences to have varying preferences. We consider some commonly studied settings in which the audiences may have differing preferences over some vertical or horizontal quality characteristic. We derive the return-to-reputation function in these examples and show that even in these standard settings, the return-to-reputation function is not linear, and can be non-monotonic. We illustrate the reward functions in Fig. 1.

2.3. Horizontal reputation of a monopolist

Consider a monopolist who sells a product of unknown type θ, where θ is a horizontal characteristic. The firm faces two consumers.[5] The consumers and the firm have the same common prior about the horizontal product characteristic: As before, $\theta \sim N(\mu, \sigma^2)$. The monopolist can take a costly action a to change the product characteristic. The cost of taking action a is $\frac{1}{2}a^2$.

Consumer 1's valuation of a product of quality θ is given by $v_1(\theta) = 3 - (1-\theta)^2$, and consumer 2's valuation is given by $v_2(\theta) = 3 - (1+\theta)^2$. This can be interpreted as the consumers having preferences over some horizontal characteristic of the product with consumer 1 having her bliss point at $\theta = 1$ and consumer 2 at $\theta = -1$. Each consumer can get a maximum value 3 from consuming the product. From consuming a product whose quality is not at her bliss point, the consumer suffers a loss that is quadratic in the distance from the bliss point.

Consumer 1 when purchasing and consuming the good with reputation given by a normal distribution with mean μ and variance σ^2 anticipates a utility of

$$3 - \int_{-\infty}^{\infty} (1-l)^2 \frac{e^{-\frac{(l-\mu)^2}{2\sigma^2}}}{\sigma\sqrt{2\pi}} dl - p = 3 - (1-\mu)^2 - \sigma^2 - p, \tag{1}$$

if purchasing the good at a price p. Similarly, consumer 2 anticipates a utility of $3 - (1+\mu)^2 - \sigma^2 - p$.

First suppose that the monopolist can perfectly price discriminate. Then her reward function is simply the sum of the rewards that she would obtain by dealing with each of the two consumers entirely separately, i.e., the monopolist would earn

$$R\left(N\left(\mu, \sigma^2\right)\right) = \max\left\{0, 3 - (1-\mu)^2 - \sigma^2\right\} + \max\left\{0, 3 - (1+\mu)^2 - \sigma^2\right\}. \tag{2}$$

Instead, if the monopolist had to charge a common price to all consumers then in setting her optimal price, the monopolist can consider three possible optimal strategies (i) not to sell, thereby earning profits of 0 (ii) sell to only one of the two consumers (a) if $\mu > 0$ this means setting $p = 3 - (1-\mu)^2 - \sigma^2$ and earning profits of $3 - (1-\mu)^2 - \sigma^2$ and (b) if $\mu < 0$ this means setting $p = 3 - (1-\mu)^2 - \sigma^2$ and earning profits of $V - (1+\mu)^2 - \sigma^2$ and (iii) sell to both consumers (a) if $\mu > 0$ this means setting $p = 3 - (1-\mu)^2 - \sigma^2$ and earning profits of $6 - 2(1+\mu)^2 - 2\sigma^2$ and (b) if $\mu < 0$ this means setting $p = 3 - (1-\mu)^2 - \sigma^2$ and earning profits of $6 - 2(1+\mu)^2 - 2\sigma^2$.

It follows that we can write the return function as

$$R\left(N\left(\mu, \sigma^2\right)\right) = \max\Big\{0, 3 - (1+\mu)^2 - \sigma^2, 3 - (1-\mu)^2 - \sigma^2, \left(6 - 2(1+\mu)^2 - 2\sigma^2\right) 1_{\mu>0} + \left(6 - 2(1-\mu)^2 - 2\sigma^2\right) 1_{\mu<0}\Big\}. \tag{3}$$

[3] Typically, modelers restrict attention to non-negative actions; however, as will be clear below this can be restrictive and in some of our applications (for example when a denotes a "horizontal" rather than "vertical" action) there is no natural interpretation for such a restriction.

[4] Note that since we fix the prior distribution and signal structure throughout, in equilibrium $E[\theta|z]$ is sufficient to characterize the posterior distribution.

[5] Here, we model two consumers for tractability. A continuum of consumers with greater mass on extreme types would yield similar results. A uniform distribution of consumer types would yield a single-peaked reward function.

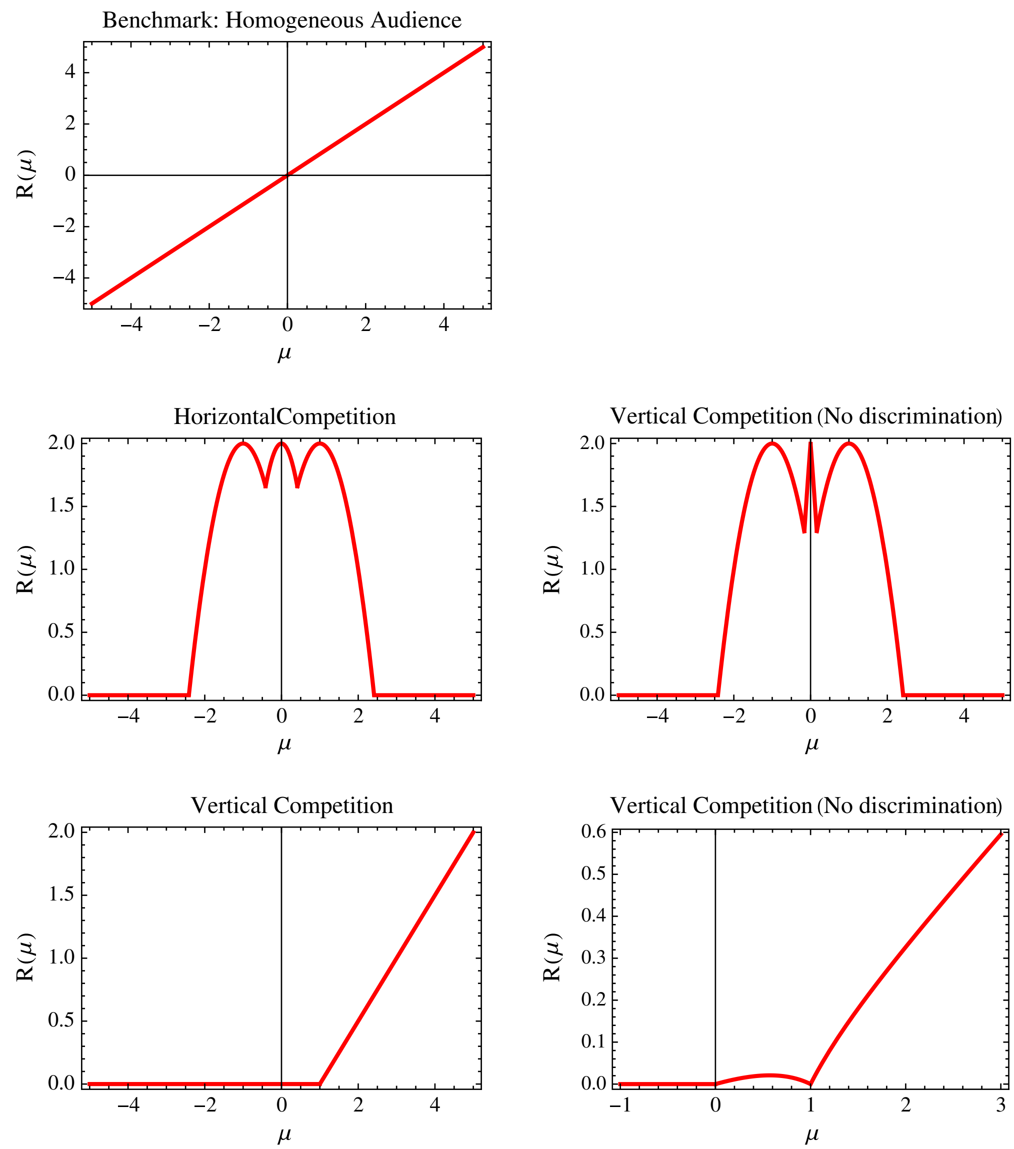

Fig. 1. Return-to-reputation functions.

Fig. 1 shows this return-to-reputation function is non-monotonic and has several sharp changes in direction.

2.4. Vertical reputation in a competitive environment

Consider next an example with vertical quality differentiation and competition, in the spirit of Shaked and Sutton (1982). Suppose that there is an incumbent whose quality is fixed and known to be equal to 1. We consider the reward function for an entrant establishing a reputation for quality. The entrant has unknown quality θ drawn from a normal distribution with mean μ and variance σ^2. The quality level is unknown to both the entrant and customers. As in the other examples, the entrant can take a costly action a to affect the quality of the output: An entrant of quality level θ who takes action a produces an output $z = \theta + a + \varepsilon$ where ε is drawn from a standard normal distribution.

A consumer's willingness to pay depends on his preferences for quality and the expected quality of the product. Suppose that consumers vary in their tastes for quality, denoted by t, where t is uniformly distributed on [0, 1]. A consumer of type t anticipates obtaining utility $tE(\theta) - p$ when consuming a good of expected quality $E(\theta)$ and price p.

Trivially if both monopolist and entrant could charge different prices to different consumers then Bertrand price competition between the two firms implies that if the entrant's expected quality was below the incumbent's $E(\theta) < 1$, then it would earn nothing. Instead, if the entrant's quality were higher then, in equilibrium, it would charge a consumer of type t a price of $t(E(\theta) - 1)$. In this case, the reward function would be

$$R(\mu) = \left\{ \begin{array}{ll} 0 & \text{if } \mu < 1 \\ \frac{\mu - 1}{2} & \text{if } 1 \leq \mu \end{array} \right\}. \tag{4}$$

Suppose instead that both the incumbent and the entrant cannot price discriminate. First if $E(\theta) < 0$, then trivially, the entrant optimizes by not selling and earning no profits since the entrant cannot charge a positive price and make sales. Next, suppose that the entrant's expected quality is $0 \leq E(\theta) < 1$. Then we can define consumer t_1 who is indifferent between buying from the entrant and incumbent implicitly through the equality $t_1 E(\theta) - p_e = t_1 - p_i$ where p_e is the price charged by the entrant and p_i is the price charged by the incumbent; and define t_0 as the consumer indifferent between buying from the entrant and not buying at all, so that t_0 is implicitly defined by $t_0 E(\theta) - p_e = 0$. Then $t_1 = \frac{p_i - p_e}{1 - E(\mu)}$ and $t_0 = \frac{p_e}{E(\theta)}$; profits for the entrant are given by $p_e(t_1 - t_0)$ and profits for the incumbent are given by $p_i(1 - t_1)$. By simultaneously solving the first order conditions for the profits of entrant and incumbent we can obtain that in this case the entrant's profits are given by $E(\theta)\frac{1-E(\theta)}{(4-E(\theta))^2}$.

Finally, suppose that $1 \leq E(\mu)$. Then the indifferent consumer between the entrant and incumbent is again $t_1 = \frac{p_e - p_i}{E(\theta)-1}$ and we can define the type indifferent between buying from the incumbent and not buying as $t_3 = p_i$. In this region the entrant's profits are given by $p_e(1 - t_1)$ and the incumbent's profits are given by pi$(t_1 - t_3)$. It can be shown that in this case, the entrant's profits are given by $4E(\theta)^2\frac{E(\theta)-1}{(4E(\theta)-1)^2}$.

Overall, therefore the return function for the entrant is non-monotonic in the prior, and is given by

$$R(\mu) = \begin{Bmatrix} 0 & \text{if } \mu<0 \\ \mu\frac{1-\mu}{(4-\mu)^2} & \text{if } 0\leq\mu<1 \\ 4\mu^2\frac{1-\mu}{(4\mu-1)^2} & \text{if } 1<\mu \end{Bmatrix}. \tag{5}$$

The examples of vertical differentiation, and horizontal reputation highlight that these standard IO models lead to reward functions that are non-monotonic in the mean reputation. This non-monotonicity can arise, in part, through aggregating the rewards that would be generated in dealing with individual consumers separately, as illustrated in the case of horizontal reputation with price discrimination. However, additional structure—common pricing decisions in the above examples—can lead to further turning points or cause non-monotonicity in the reward function (as in the case of vertical differentiation). Indeed, in the latter case, a simple aggregation of reputation rewards in the case of individual audiences (the perfectly discriminating case) implies a monotonic reward function whereas in the aggregate model with no price discrimination, non-monotonicity arises.

As Bouvard and Levy (2012) and Frenkel (2012) highlight, in the context of credit rating agencies, even if the agent is collecting payment from a single audience with homogeneous preferences, the agent's reputation may affect another audience in his dealings with agent's customer and this can lead to non-monotonic rewards. Specifically, they consider a credit rating agency building a reputation for being tough or lax with issuers (its customers) but investors are relevant insofar as their beliefs about the credit rating agency's behavior affect how much they would pay for a rated issue and, thereby, how much an investor would pay to be rated.

3. Reward functions and career concerns

Having derived the return-to-reputation function, we can now ask what the agent's optimal action is. We begin by characterizing the optimal action in the general framework at the start of Section 2.

3.1. General results

The audience's posterior belief about the agent's type θ, following an observation of signal s when the equilibrium action a^* is anticipated, is distributed normally with mean $\nu = \frac{h\mu+s-a^*}{h+1}$ and precision $h + 1$. This allows us to write:

$$\begin{aligned} E_{\varepsilon,\theta}[R(\mathbb{E}[\theta|z])] &= \int\int_{\theta,\varepsilon} R\left(\frac{h\mu+\theta+\varepsilon+a-a^*}{h+1}\right)\phi_\theta(\theta)\phi_\varepsilon(\varepsilon)d\theta d\varepsilon \\ &= \int_Y R\left(\frac{h\mu+Y+a-a^*}{h+1}\right)\phi_Y(Y)dY, \\ &= \int_x R\left(\mu+\frac{a-a^*}{h+1}+\frac{x}{\sqrt{h(h+1)}}\right)\phi_x(x)dx, \end{aligned} \tag{6}$$

where $Y = \theta + \varepsilon$ is normally distributed with mean μ and precision $\left(\frac{1}{h}+1\right)^{-1} = \frac{h}{h+1}$ and $\phi_x(\cdot)$ is the normal density function associated with the variable x. The last equality follows using a change of variables (i.e. $x = \frac{Y-\mu}{\sqrt{\frac{h+1}{h}}}$, so $dx = \frac{dY}{\sqrt{\frac{h+1}{h}}}$).

When the first order condition applies, the agent's maximization is the solution to

$$c'(a) = \frac{1}{h+1}\int R'\left(\mu+\frac{a-a^*}{h+1}+\frac{x}{\sqrt{h(h+1)}}\right)\phi(x)dx. \tag{7}$$

In equilibrium $a = a^*$, so that an equilibrium effort satisfies

$$c'(a^*) = \frac{1}{h+1}\int R'\left(\mu+\frac{x}{\sqrt{h(h+1)}}\right)\phi(x)dx. \tag{8}$$

At this level of generality, it still requires proof that a solution exists and is unique and in writing Eq. (8), we implicitly assume that $R(\cdot)$ is differentiable almost everywhere and that the second order condition is satisfied; that is[6]:

$$c''(a^*) \geq \frac{1}{(h+1)^2}\int R''\left(\mu+\frac{x}{\sqrt{h(h+1)}}\right)\phi(x)dx. \tag{9}$$

We maintain these assumptions throughout the remainder of this paper. It is worthwhile to mention two features of our framework. First, in supposing that the distribution of agent's type is normally distributed (rather than say, distributed with finite support) we are able to fully separate the effect of changes in the mean prior from changes in the precision. Second, in supposing that the signal is additive in ability action and noise, we similarly avoid effects that arise technologically from the signal-to-noise ratio varying with underlying ability. These assumptions, therefore allow us to focus squarely on how the shape of the reward function affects the strength of reputation incentives; though, in applications, these other considerations are likely to play a role and effects may interact. Taking the derivative of Eq. (8) with respect to μ and rearranging allows us to write

$$\frac{da^*}{d\mu} = \frac{1}{c''(a^*)}\frac{1}{h+1}\int_x R''\left(\mu+\frac{x}{\sqrt{h(h+1)}}\right)\phi(x)dx. \tag{10}$$

By inspecting the expression above it is easy to establish the following result.

Proposition 1. *Under the maintained assumptions on the differentiability of $R(\cdot)$ and the validity of the second order condition, the agent's optimal action choice a^* is increasing in reputation (μ) if the reward function $R(\cdot)$ is convex and decreasing if $R(\cdot)$ is concave.*

It is immediate from Proposition 1 above that in the setting of Holmström (1999) with linear reward functions, the optimal action will be independent of the reputation level. However, in general, the optimal action for the agent can depend on the reputation level, and can even switch signs from positive to negative. In returning to our earlier illustrative examples we show that this is the case.

Note also that we can investigate the effect of precision of the public signal on the agent's optimal action choice. Taking the derivative of Eq. (8) with respect to h, the precision on the reputation, and rearranging allows us to write

$$\frac{da^*}{dh} = -\frac{1}{c''(a^*)}\frac{1}{h+1}\left[c'(a^*)+\int_x R''\left(\mu+\frac{x}{\sqrt{h(h+1)}}\right)\frac{x}{2}\frac{2h+1}{(h(h+1))^{\frac{3}{2}}}\phi(x)dx\right]. \tag{11}$$

[6] A sufficient condition is that $R(\cdot)$ is not too convex.

Holmström (1999) and, perhaps, simple intuition suggests that more uncertainty leads to higher actions. To see why, note that higher uncertainty implies that the agent's action choice is likely to have a greater impact on posterior beliefs. This gives the agent a stronger incentive to take costly actions. The above expression suggests that, in general, this need not be the case. Rather, higher precision has two effects on the agent's action. The first effect (captured in first term in the square brackets) is that higher precision of the signal dampens the agent's incentive to exert effort (or brings effort closer to 0). This effect is the same as in the canonical case with a linear return function.[7] However, there is also a second effect (captured by the second term in the square brackets). This effect depends on the shape of $R(\cdot)$ and the location of the prior, and can overwhelm the effect of the first term, so that greater precision may lead to more extreme actions. The intuition is that marginal changes in the posteriors have bigger impacts at some posteriors than others. High precision, not only dampens the impact of the observation, but also keeps the posterior closer to the prior. If this is where the returns to increasing the prior are relatively high, as compared to other regions of the reward function then high precision can lead to more effort than low precision. The non-monotonicity of effort in precision in the context of specific reward functions has been noted elsewhere; specifically, Martinez (2009), Casas-Arce (2010) and Miklos-Thal and Ullrich (2012).

3.2. Optimal action in examples with heterogeneous preferences

Let us now revisit the examples in Section 2. Given the reward functions characterized in Section 2, we can characterize equilibrium effort as a function of the prior reputation, or as a function of precision. In Fig. 2, we apply the expression Eq. (8) to plot the agent's optimal action at different reputation levels (for precision $h(=\sigma^{-2})=10$). Recall also that the cost of taking action a is given by $c(a)=\frac{a^2}{2}$ so that $c'(a)=a$.

As the first panel in Fig. 2 suggests, in the canonical Holmström (1999) framework with homogenous audience preferences, the agent's optimal action is independent of the starting reputation.[8] However, this is no longer true if we consider heterogenous preferences. In general, the agent's optimal action can be increasing or decreasing in the initial reputation, and for small changes in the initial reputation, the optimal action may change discontinuously and even change sign.

Consider, the example with horizontal differentiation. We know that the return function of the monopolist can display sharp changes in direction. Panels (ii) and (iii) show that, consequently, the optimal action can be non-monotonic and display reversals as well.

One application is to advertising decisions in a market with horizontal differentiation. A firm may choose its advertising to highlight some aspects of its product rather than others, and by stressing particular aspects, or by investing in marketing an image, a firm can develop a "horizontal reputation." As a concrete example, the tobacco industry is a prominent example of a relatively homogeneous good, where different products have been marketed to develop particular horizontal reputations.[9,10] It is noteworthy that brands have entirely reversed their marketing strategies; for example, the Marlboro brand, associated with the "Marlboro man" was originally intended and marketed as a feminine brand to appeal to women.[11] This is consistent with our simple reduced form model where stochastic realizations might lead a firm to reverse the direction of its branding.[12]

Similarly, as Fig. 2 illustrates in panel (v), in a model with vertical differentiation (and where the firm cannot discriminate between customers and competes with a rival of known quality), the firm may prefer to take positive or negative actions that raise or lower perceived quality depending on the initial reputation. Again small changes in initial reputation can lead to reversals in marketing strategies, consistent with changes in the advertising of Pabst Blue Ribbon beer in the 1940s from a luxury or high-end product closer to its current perception as more an everyman's drink.[13]

4. Conclusions

When there are several audiences with heterogeneous preferences, then determining what a "good" reputation is a non-trivial exercise, as illustrated in Section 2. Indeed, horizontal differentiation is not necessary: Even when an agent is establishing a reputation for quality, then a standard model of vertical differentiation highlights that a firm could gain from a reputation for lower or higher quality. We summarize the payoffs associated with different reputation levels in a "returns-to-reputation function" and argue that with heterogeneous audiences, it is natural that this function be non-monotonic. Section 3 highlights that this has implications for reputation-building: Depending on an agent's initial reputation, the agent's optimal choice of action may reverse sign.

A limitation of our analysis is that we consider only a two-period model. In many applications, the assumption that there is a single period in which reputation is established is unrealistic. There may, however, be cases where it is realistic to think of a firm or agent's life as divided between a reputation-building stage and a stage where there are no further learning opportunities or where any learning is largely irrelevant.[14] Extending the analysis beyond two periods, however, is difficult since the continuation value in any non-terminal period depends on the cardinal values of the actions to be taken in the future, and thus requires characterization not only of the comparative statics of actions but also their absolute values (and specifically the costs of these actions) as inputs into continuation values. [15] Further, in the two-period model, the audiences perfectly anticipate the agent's action, and the agent and audiences hold the same beliefs. However, in a multi-period model, the long-run agent's incentives on the equilibrium path are determined

[7] Recall we allow for negative values of a^*, but whether a^* is positive or negative the term $-\frac{a^*}{1+h}$ moves the optimal action towards 0.

[8] As mentioned above, this can be seen directly from Proposition 1.

[9] As an example, see Vaknin, 2007 citing Alan Blum that …the brand of cigarette of cigarette you smoked often marked you as a fan of a particular baseball team: New York Giants fans would probably smoke a Chesterfield, a Yankee fan Camels and Lucky Strike would be preferred by Dodgers supporters p.9.

[10] This example may be imperfect in the sense that changes in marketing strategy are likely to leave persistent effects on a brand's image, while in our two-period model, the effect of actions is necessarily temporary. However, we conjecture that allowing for more persistent effects of actions would yield similar non-monotonicities and reversals in the optimal action choice.

[11] See Vaknin (2007). Marlboro was originally produced by Philip Morris as a woman's cigarette. They were advertised as being 'Mild as May' for the female palate and had 'Ivory Tips' to 'protect the lip'…quite a different image from the masculine symbol it was to become…(p.45). Even in 1951, Philip Morris was using this particularly strange image of an adorable infant with a baby-pink background to sell cigarettes to mothers… The early 'new' Marlboro advertisements in 1954 pictures images of men who typified 'masculine confidence'… Later the campaign was refined by the Leo Burnett advertising agency to the image that was to endure all over the world for the next thirty years, the Marlboro cowboy and 'Marlboro Country'. (p.69–70).

[12] There is related literature on advertising in markets with horizontal differentiation. In particular, Grossman and Shapiro (1984) demonstrate that the market-determined level of informative advertising may be socially excessive, and that cheaper advertising technologies may lead to more severe price competition and reduced profits. Anand and Shachar (2011) provide empirical support for an informative rather than persuasive role for advertising, highlighting, in particular, that exposure to informative advertising on a horizontal characteristic leads some consumers to reduce their demand for the good. This literature supposes that consumers either learn the characteristic or not, and not that the firm takes costly actions to change public perception of the good.

[13] See, for example, http://bluebomber.wordpress.com/2008/11/page/2/ for the evolution of Pabst Blue Ribbon advertising.

[14] Examples include academic tenure and the period as associate prior to a partnership decision in consulting and law firms.

[15] Indeed, such dynamics in themselves can lead to non-monotonic reward functions even with a homogeneous audience, as shown in Kartik and Van Weelden (2013).

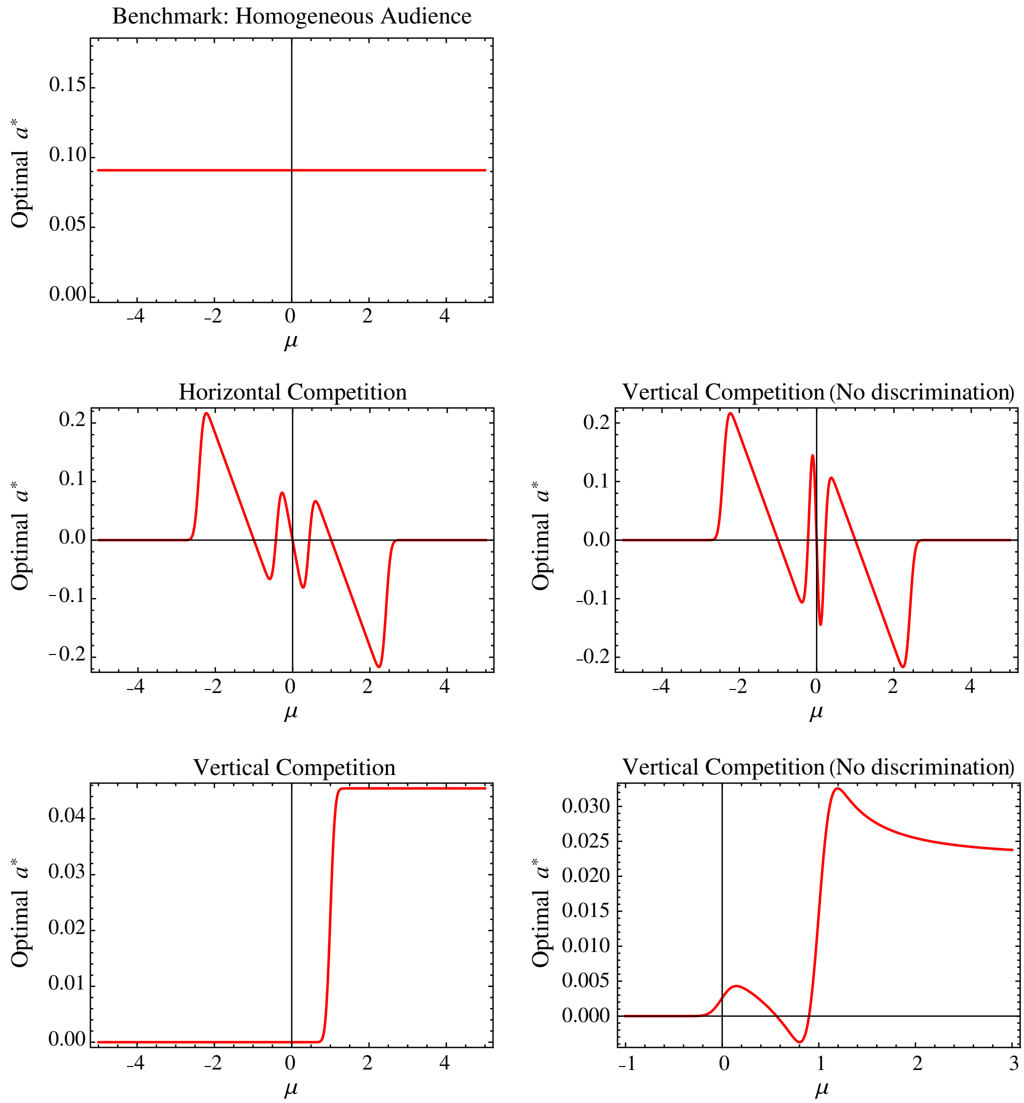

Fig. 2. Optimal action and reputation.

by the gains from possible deviations off the equilibrium path. Evaluating the agent's off-equilibrium payoffs is challenging because, after a deviation takes place, the agent acquires private information about his type, and the public (audience's) beliefs and private (agent's) beliefs are no longer aligned. The agent can thus condition his actions on both the private and public beliefs, and the audience may be constructing posterior beliefs using an incorrect conjecture about the agent's actions. Thus, analyzing multi-period problems is likely to be involved, and would require imposing considerably more structure on the single-period cost and reward functions.

This paper is a first step in our larger agenda of understanding reputation building with multiple audiences. Here, we highlight that in the presence of heterogeneous audience preferences, characterizing the value of reputation (and consequently, describing optimal behavior) is subtle, and qualitatively different from a setting with homogeneous preferences. In related and ongoing work, we explore other considerations that arise when building reputation with heterogeneous audiences.

Clearly, an agent's reputation incentives are determined by the preferences and information of the audiences that the agent faces. Consequently, to the extent that the agent is able to choose the audiences that he faces, he can, in effect, commit to particular behaviors. We explore this idea in an ongoing work, Bar-Isaac and Deb (2013) that analyzes the reputational incentives that drive the optimal choice of a firm's portfolio of clients.

In another paper Bar-Isaac and Deb (forthcoming), we consider heterogeneity in information held by different audiences. Specifically, we study reputational incentives of an agent who faces two audiences with opposed preferences and allow the audiences to have the same or different information about the agent's actions. We consider two polar cases: one in which the two audiences have identical information, and another in which each audience has different information. We show that reputation is necessarily bad (has no disciplining effect) when the audiences have different information, in the sense that the agent's average per-period payoff is lower than it would be in a one-shot interaction.

Audiences with heterogeneous preferences raise a range of new issues including the agent's uncertainty about audience preferences, audiences' uncertainty about the other audiences that an agent faces, and more broadly, richer and multi-dimensional notions of reputation that incorporate audiences' higher-order beliefs about each other's beliefs. We believe that this presents an exciting field for new theory and applications.

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